

HYDROGEN-BROADENED WATER FROM 50 TO 300 cm^{-1} AND 1300 TO 4000 cm^{-1}

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To support remote sensing of the outer planets, absorption spectra of H_2O broadened by H_2 were recorded at room temperature using two Fourier transform spectrometers. The data from 1300 to 4100 cm^{-1} were obtained at 0.012 cm^{-1} resolution with the **McMath FTS** located at Kitt Peak National Observatory / National Solar observatory. The remainder of the spectral data from 55 to 320 cm^{-1} was taken at 0.0056 cm^{-1} with the **Brucker FTS**. Some 500 H_2 -broadened linewidths of H_2O between 55 and 39.50 cm^{-1} were obtained with precisions of 2 to 5% for the five bands [perpendicular: rotational; ν_2 at 1595 cm^{-1} ; $2\nu_2$ at 3152 cm^{-1} ; ν_1 at 3657 cm^{-1} and parallel: ν_3 at 3756 cm^{-1}]. The vibrational (band to band,) dependencies of the four perpendicular bands were found to be less than 10%, but within a band, the widths varied with the rotational quantum numbers from 0.1 $\text{cm}^{-1}/\text{atm}$ to 0.035 $\text{cm}^{-1}/\text{atm}$ at room temperature. Systematic patterns were detected in the widths as a function of AJ, J, Ka, and asymmetry. At low Ka, the widths decreased with increasing J, but for Ka > 3, the widths increased with increasing J. Line mixing between pairs of water lines were also observed.

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